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Division of Mycology and Disease Survey

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THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

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EXTENSION OF RANGE OF THE DUTCH ELM DISEASE AND ITS KNOWN DISTRIBUTION IN THIS COUNTRY

According to the report of the Bureau of Entomology and Plant Quarantine for the week ending July 30 "Confirmation of two elms in Pennsylvania marked the discovery of the disease in another State."

Both trees were located in Northampton County, the first, a 42" DBH tree overhanging the Delaware River, in Upper Mt. Bethel Township, the second about three and one-half miles from the other, near Bangor. Northampton County is just across the Delaware River from Warren County, New Jersey, and the ten-mile protective zone surrounding the New Jersey infected area has extended into both Northampton and Bucks Counties for some time.

In New York a new county has been added this year to the infected zone, by the confirmation of five trees in Dutchess County (reports of June 25, July 2, July 16). Of particular significance is the fact that two of these confirmations, in the township of Washington and in the town of Millbrook, bring the boundary of the infected zone within 22 miles of the Massachusetts State line.

The places where the Dutch elm disease has been found in the United States are shown on the accompanying map (Fig. 1). The history of the disease in each locality is summarized in Table 1, which gives the number of infected trees that have been found each year since the discovery of the disease in this country, in the generally infected area and in the isolated locations shown on the map. Both map and table have been compiled from the reports of the Bureau of Entomology and Plant Quarantine.

Table 1. Number of trees found to be infected with *Ceratostomella ulmi* to July 30, 1938.

Location	1930	1931	1932	1933	1934	1935	1936	1937	1938 to July 30	Totals
Cleveland, Ohio	3	4	0	1	2	23	0	0	0	33
Cincinnati, Ohio	1	0	0	0	0	0	0	0	0	1
New Jersey				740	4,377	4,113	5,793	4,806	5,080	24,909
New York				77	2,427	2,258	1,741	1,268	725	8,496
Connecticut				1	56	76	102	125	254	614
Baltimore, Md.				1	0	0	1	0	0	2
Norfolk, Va.					1	3	1	0	0	5
Indianapolis, Ind.					4	10	19	32	23	88
Brunswick, Md.						3	0	0	0	3
Cumberland, Md.							1	0	0	1
Athens, Ohio								1	3	4
Wileys Ford, W. Va.								5	0	5
Northampton County, Pa.									2	2
Totals	4	4	0	820	6,867	6,486	7,658	6,237	6,087	34,163

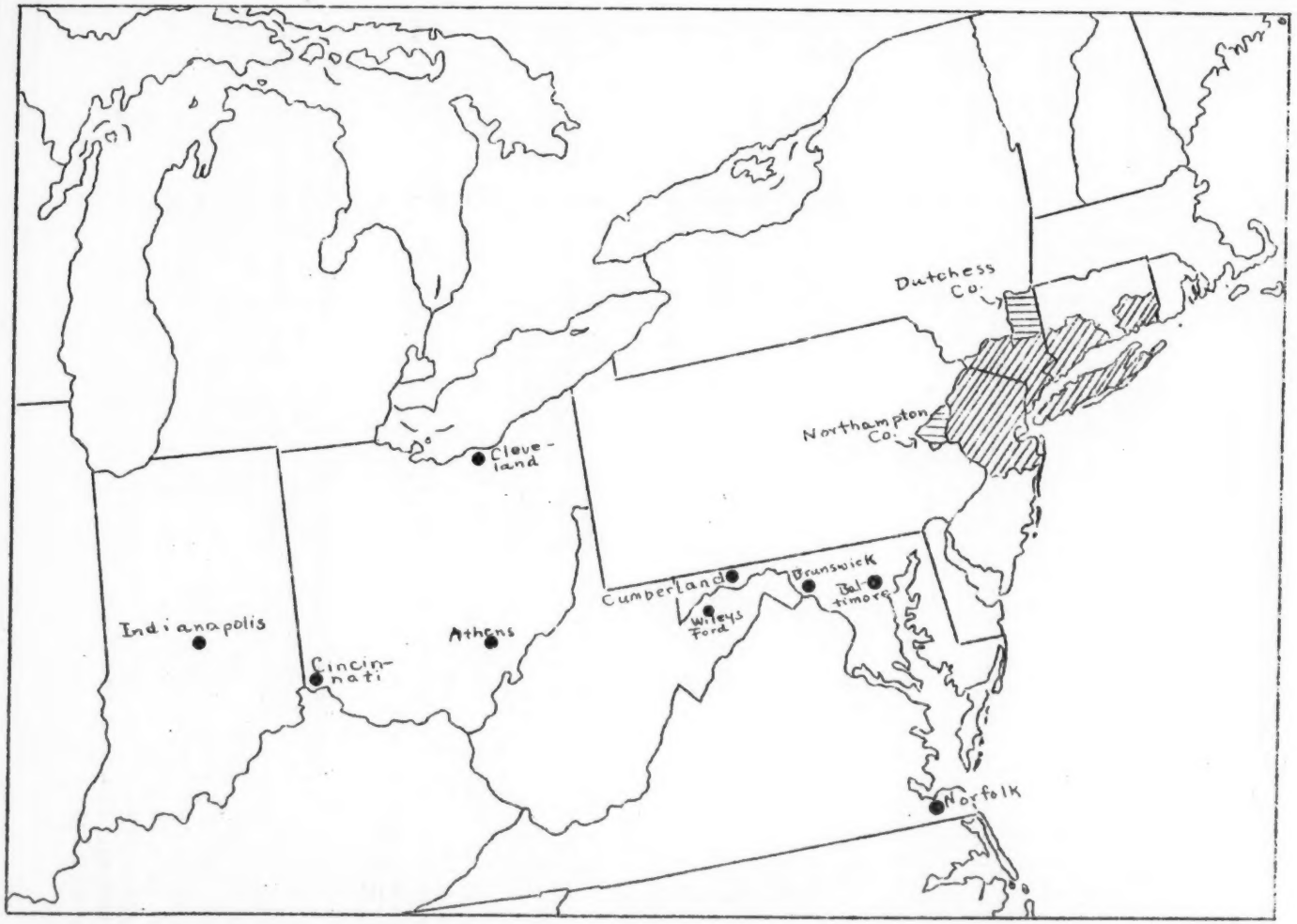

Figure 1. Places where the Dutch elm disease has been found since its first discovery in the United States. Generally infected zone in the tri-State area is indicated by shading. Horizontal shading shows the new counties in New York and Pennsylvania. (See also Table 1).

HISTORY OF CHESTNUT BLIGHT IN ILLINOIS

H. W. Anderson

Discovery of the first case of chestnut blight in Illinois was made by Miss Amelia Riehl near Godfrey, Illinois. The Riehl chestnut orchard, situated on the bluff above the Mississippi River, is of historic interest because of the pioneer work done by Mr. E. A. Riehl, father of Amelia, in breeding chestnuts. This orchard had been planted over a series of years and the oldest trees were about 50 years old. The first case of chestnut blight was on a Rush chinquapin tree. Although Miss Riehl cut down a chestnut tree at this same time, under the impression that it was suffering from blight, the specimen on which blight was first positively identified was from the Rush chinquapin.

Miss Riehl collected the first specimen in the summer of 1925. The tree on which it occurred was cut down and burned at that time, but fortunately Miss Riehl saved a few chips which she placed in a fruit jar and stored in a barn. In January, 1926, this specimen was sent to the University of Illinois, where the writer made cultures from the specimen and positively identified the fungus as Endothia parasitica. Two inspection trips were made to the Riehl farm in the winter and early spring of 1926 and another in the summer. No further evidence of blight was found at this time.

In 1926, an entomologist from the U. S. Department of Agriculture found a specimen of blight in another chinquapin tree on the Riehl place. This specimen was identified as Endothia parasitica by G. F. Gravatt, of the U. S. Department of Agriculture. This tree was also destroyed by Miss Riehl before an examination was made. A year later, in digging around the burned stump of this tree, a small diseased area of the old bark well below the ground line was found and positively identified as E. parasitica by the writer. This tree stump was immediately dug out and burned.

Upon discovery of the blight at the Riehl farm, a careful inspection was made of such other plantings as were known in the State and a number of trees in back yards, streets, etc. were also examined without finding the disease. No further evidence of blight was found in the Riehl orchard until 1931, when the writer discovered three trees showing blight in the bearing orchard, but none was found among the nursery trees. From this date on, a few new cases of blight were found each year until, in 1934, some fifty trees were infected. The trees in most cases were destroyed, but in a few cases large limbs were cut off or the cankers were cut out.

In 1932, a case of blight was found in the Endicott orchard at Villa Ridge in Pulaski County, which, like the Riehl orchard, was of historic interest, since Mr. Robert Endicott's father had been greatly interested, along with Mr. Riehl, in developing superior commercial varieties of chestnuts in the Middle West, and Mr. Robert Endicott had continued growing and breeding experiments. The case at the Endicott orchard was the first found in southern Illinois in the Ohio Valley. This is of interest, since it was expected that chestnut blight would appear first in this region because of the river connection with the eastern blight area. Native chestnut trees are found in southern Indiana, and Dr. William Trelease records a single stand of what appears to be native chestnuts near Olmsted, Illinois. This native stand was never examined for blight, but, since 1918, the writer has made almost yearly inspections of Mr. Endicott's trees and, since he had had extensive experience with the disease in the East, it is safe to state that it did not appear in this region until about 1931. The single tree on which the disease was found in 1932 had been cut in the winter of 1931-32, so that it is evident that it must have had the disease in 1931. In 1933, three additional cases of blight were found in the Endicott orchard.

In 1932, the writer observed chestnut blight on a number of young trees in a native stand near Madison, Indiana.

In 1933, the Whitford orchards near Farina, Illinois, in Fayette County (south central Illinois) were examined. Blight was found on two trees in one of his orchards east of Farina but none in the nursery trees at Farina. This is an interesting case because Mr. Whitford has the largest planting of chestnuts in Illinois. These plantings are in a region well isolated from the older established chestnut orchards and, so far as could be determined, there are very few chestnut trees grown around farmsteads in this section of the State.

An important find was at Lincoln, in Logan County, Illinois. These trees were discovered in 1930 by Mr. J. S. Conard, a state nursery inspector. A number of large chestnut trees, probably thirty or more years old, had been planted on the grounds of a state school for feeble-minded children. Several of these trees had very extensive cankers in the tops, which must have been active for at least four or five years. It is evident that these trees had been planted before chestnut blight was present in this country. So far as could be learned, no young trees were known to have been set out in Lincoln and there were no younger trees on these grounds. Here was an extensive infection which it is hard to account for.

About 1933, Mr. Conard became interested in the chestnut blight problem and after this date much of the inspection of trees was made by him. Along with A. S. Colby, of the Department of Horticulture, Mr. Conard took an interest in locating trees in his nursery inspection trips

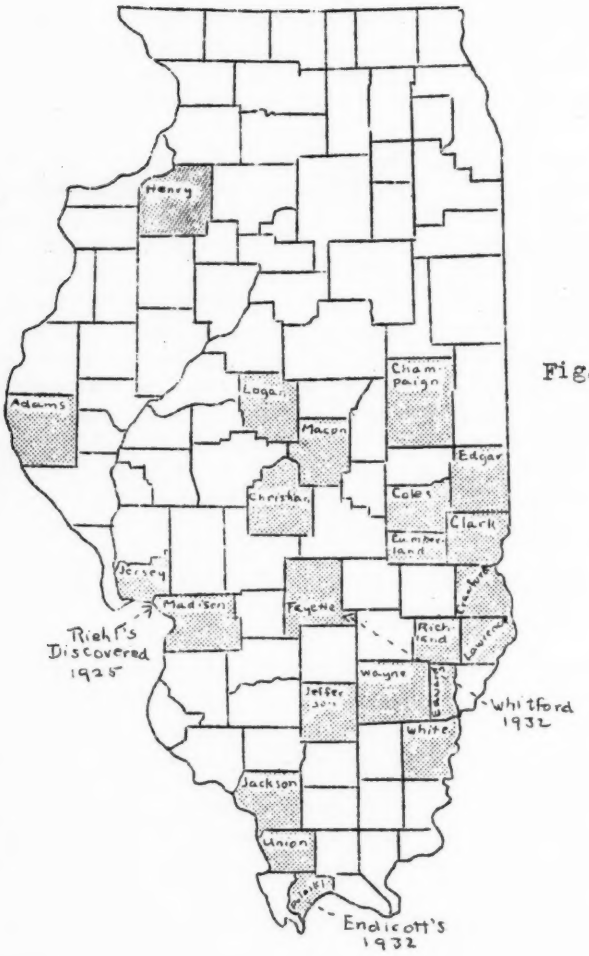

Fig. 1. Counties in Illinois in which chestnut blight has been found.

and, whenever he learned of these trees, he took pains to find them and to make yearly inspections. In this way it was learned that many more chestnut trees were grown as shade trees in this State than had been suspected. Between 1930 and 1938, Mr. Conard has found chestnut blight in twenty-three counties of the State, as is indicated on the accompanying map (Fig. 1). A copy of Mr. Conard's records of the first occurrence of the disease in various parts of the State is given in Table 1. In some cases the dates are at variance with those mentioned above, owing to the fact that other persons made earlier observations. Whenever there was any doubt about the identification of the disease, the specimens were submitted to the writer for confirmation.

Table 1. Counties in Illinois where chestnut blight has been found and the place and year first reported (Report of J. S. Conard)

1.	Adams	Forest Oak Nursery	1930
2.	Champaign	J. C. V. Taylor farm S. W. of Homer	1936
3.	Christian	Maton farm east of Rosamond	1934
4.	Clark	Wm. Geahardt farm S. W. of Marshall	1935
5.	Coles	Charleston Normal School grounds	1935
6.	Crawford	Roscoe Keenan place, 307 S. King Street, Robinson	1935
7.	Cumberland	Aldrich yard, south edge of Neoga	1934
8.	Edgar	Ora Bussart farm, east of Redmond	1933
9.	Edwards	Hoelzle place, 802 W. North Street, Grayville	1935
10.	Fayette	C. W. Kaeferle farm 1 mile east of Farina	1934
11.	Henry	Alpha Nursery, Alpha	1936
12.	Jackson	N. E. of Makanda	1936
13.	Jefferson	John Gage Fruit Farm, Mt. Vernon	1934
14.	Jersey	E. A. Riehl grove, Alton (reported by H. W. Anderson)	1925
15.	Lawrence	On the old Akin farm, Billet	1935
16.	Logan	Lincoln Asylum grounds	1930
17.	Macon	530 W. Main Street, Decatur	1934
18.	Madison	M. J. Keidel farm, Alton	1934
19.	Pulaski	Bob Endicott farm, Villa Ridge	1934
20.	Richland	Olney Postoffice grounds	1935
21.	Union	Isaac Hartline farm S. W. of Cobden	1934
22.	Wayne	Wm. Anderson farm S. E. of Xenia	1933
23.	White	Ed Pomeroy farm S. E. of Carmi	1935

Theories as to Origin of the Disease

Mr. Conard's work probably aids in clearing up the problem of the origin of the disease in the State. The possible explanations are:

1. That it might have entered by way of the Ohio River on logs or branches floating down from eastern areas.

2. That it might have been brought in by nut growers who had obtained scion wood or trees from the East shortly after the disease had been introduced into this country and before the quarantine was established.

3. That wind currents from the Eastern States may have carried large quantities of spores to this section.

4. That it may have been brought in on telephone poles or other timber from the East previous to regulations for the treatment of such timber before shipment.

5. That birds or insects might have carried it from the East, or, more probable, that it was brought in on the feathers or feet of migratory birds from the native stands of chestnuts in Kentucky or Tennessee.

6. That infected trees may have been brought in by auto by persons visiting Eastern States who were not sufficiently acquainted with the danger and who planted these trees for shade at their homes. These trees may have died but survived long enough to transmit the disease to established plantings.

There seems to be no direct evidence to support any of these theories. The disease was found first on the Riehl farm, which has no direct connection by downstream water with the Eastern area, but we are not sure now that this was actually the first case of the blight in the State. As soon as Mr. Riehl learned of the chestnut blight, he became extremely particular about securing any kind of material from Eastern States, because he realized the danger of introducing the disease into his groves. He not only made careful inspections of his orchard, but also instructed his daughters in regard to the danger of its becoming established. He and his daughters were also very careful to inspect all nursery trees which were sent out from their plantings. It might be mentioned at this point that in all the inspections of nursery trees at the Riehl place, no cases of blight were found even when as many as fifty trees in the bearing orchard had become diseased. Thus it seems improbable that the Riehl orchard was the focus of infection. The same may be said of the Endicott and Whitford nurseries. Mr. Whitford raised a large number of chestnut trees of named varieties, but the blight was never found in his nursery at Farina. The orchard where it was found was some distance (four or five miles) from his nursery. Mr. Endicott raised few nursery trees and used most of these for his own plantings.

It was unfortunate that an extensive survey of chestnut trees was not made in Illinois until some five or six years after the discovery of of the disease. It was thought at that time that, aside from the orchards and a few shade trees, there were very few chestnut trees in the State. A surprisingly wide distribution was found when the survey was actually undertaken by Mr. Conard, although his survey was not intensive.

Another reason for believing that the disease was not introduced at one place and spread from this source is the extensive infection of the trees at Lincoln. This infection would date back to about the time the disease was discovered in the Riehl planting. The fact that after the destruction of the first trees at the Riehl farm no further blight

appeared for several years indicates that eradication had been complete and that subsequent infections probably came from other sources.

The fact that the disease was found in such widely separated areas when it was discovered indicates that multiple primary infections must have occurred. This would favor the wind or animals (insects and birds) as probable carriers of the inoculum. Since it is rare to have east to west air currents in this region, the wind theory seems more unlikely than the insect-bird theory.

Since no intensive survey had been made previous to 1932-35, it may be argued that the disease may have been introduced in several regions of the State at an early date and that these cases had escaped observation. From these isolated cases the disease may have been spread by the usual carriers to other sections of the State.

Efforts to Eradicate

When first discovered it was thought that the disease could be eradicated, or at least could be kept out of the commercial orchards and the nurseries of the State, since the nursery inspection service could be utilized for frequent inspections. Unfortunately, funds were not available for an extensive general program of eradication, especially in view of the fact that the chestnut industry in Illinois was not very large. It should be mentioned, however, that Illinois ranks high in the production of orchard chestnuts; that is, of high quality nuts of known varieties.

At the time the disease was discovered at the Riehl farm, the Chief State Nursery Inspector, Mr. P. A. Glenn, and the writer decided that, in view of the fact that the disease had apparently been entirely eradicated, it would be safe to allow nursery trees from this place to go out that season (1926) after they had been thoroughly inspected. In 1927, Miss Riehl was requested not to ship trees to any State that had a quarantine against the blight. This quarantine measure was continued until the disease was found generally prevalent in Illinois and in neighboring States. From the period of first discovery Miss Riehl also sprayed the nursery trees with a strong Bordeaux mixture after they were dug.

When the first case of blight was found by the writer in the bearing orchard, he instructed the man in charge of pruning as to the best method of cutting out the diseased areas. In most cases entire limbs were cut off well below the blight and the blighted limbs were burned at once. It was soon found, however, that there were a number of small cankered areas near the base of some of the older trees where certain bark beetles had been working. These older trees had very rough bark

and it was very difficult to locate the cankers. It is thought that some of the earlier cankers located in such places were overlooked and this may account for the general spread of the disease in this orchard, after 1932. Between 1926 and 1938, all cases of chestnut blight discovered were reported to the owners of the property, and the state nursery inspectors took the responsibility of seeing that these trees were cut down or that infected limbs were removed.

In spite of the eradication program, new cases of blight were constantly found, and, by 1936, it was realized that nothing could be done to save the chestnut trees of the State. The commercial nut growers were doing all they could to check the disease and to reduce the loss to a minimum. Nursery blocks were carefully inspected and no trees that were at all suspicious were allowed to leave the nursery. It is believed that no new cases that could be traced to nursery trees, arose during this period with the possible exception of one nursery where the disease was found to be rather widespread in the rows. These trees were condemned and the nurseryman ordered not to sell any more chestnut trees.

The fact that so many scattered cases of the disease were found, usually on old shade trees, indicated that it was not possible to eradicate the blight unless an expensive systematic survey of the whole State was made, and this did not seem justified in view of the small importance of the crop in Illinois.

Shortly after the blight was found, Mr. Gravatt, of the U. S. Department of Agriculture, was consulted as to the possibility of having a survey made by Federal agents. Mr. Gravatt stated that it would not be possible to organize such a survey and the matter was dropped. The state nursery inspection force did a great deal in making frequent inspections of nurseries but it was not possible for them to locate all chestnut trees. Mr. Conard was especially zealous in hunting out these scattered trees and it is possible that, had the State been surveyed at an earlier date and all chestnut trees located, the disease could have been eradicated. On the other hand, if the fungus is being carried in by wind or insects, it is probable that eradication measures would not have been permanently effective. The fact that the disease is well established in Indiana and Iowa is further proof that little could have been accomplished in the way of complete eradication without a general scheme of survey and inspection by all the States in the Mississippi Valley.

(University of Illinois).

COTTON ROOT ROT IN TEXAS IN 1937, AND CONDITIONS AFFECTING ITS LOCAL PREVALENCE [1]

Walter N. Ezekiel

The cotton-root-rot field trip through Central Texas, from September 21 to 24, 1937, afforded workers on root rot an opportunity to view field experiments being carried on at a number of points between Greenville, Hunt County, and Lockhart, in Caldwell County. The itinerary followed was from Greenville through Dallas, Waco, Rosebud, Temple, Austin, Lockhart, Austin again, Kimbro, and finally to College Station. Side trips were taken over the Greenville cotton testing field station of the U. S. Department of Agriculture, Substation No. 5 of the Texas Agricultural Experiment Station at Temple, and also at other points to inspect field experiments of workers in the U. S. Department of Agriculture, the University of Texas, and the Texas Agricultural Experiment Station.

En route from College Station to Greenville, and during the programmed field trip, which covered a large portion of the region in Texas in which cotton is grown most intensively and is attacked severely by root rot, the writer had an opportunity to estimate the loss sustained by the 1937 crop. Picking of the crop was well under way at this time since maturity had been hastened by dry weather. Plants that died later of root rot probably did not increase the crop loss from the disease, and the estimates made can be considered indicative of loss for the season.

Method of Estimation

Estimates were made by rapid examination of cotton fields while driving by. The approximate proportion of the area occupied by plants that had succumbed to root rot was estimated by scanning the readily visible portion of each field, and the estimated percentages recorded in rapid succession. This method of estimation was developed by the late Dr. J. J. Taubenhaus, and used in his 1928 surveys which were a part of the material included in our study (4) of crop losses in 1928.

It may be well to point out that while this method of estimation may sound crude, it is more accurate for Phymatotrichum root rot than would be tedious counts of supposed "sample areas" within the fields. This is true because the characteristically irregular distribution of the disease in the field would make it difficult to select truly representative portions. During the present trip, from time to time estimates

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[1] Contribution no. 475, Technical Series, Texas Agricultural Experiment Station, A. & M. College of Texas.

made by scanning various experimental fields were checked against the previously recorded counts of these entire fields by the respective investigators, and invariably found in close agreement.

Variability of Phymatotrichum root rot within fields is no more extreme than variation between adjoining fields and between adjacent areas. Prevalence of the disease is affected by soil and weather conditions, and also by local periodic variation not associated with weather conditions as previously brought out (10, 5, 8). The loss in one field therefore does not necessarily indicate even the effect of seasonal conditions in that particular locality. Fairly large numbers of estimates, covering as wide an area as possible, seem necessary to give a reasonable view of the situation, and this requirement is met by the "scanning" method of estimating losses from this disease.

Estimates of 1937 Losses in Texas

In 1937 estimates were made for 770 fields, located in 22 counties. Root rot was less abundant than usual over most of this area, presumably on account of weather conditions during the growing season (which were fairly typical for Texas as a whole). For the entire State, the total precipitation was below normal, and the mean temperature above normal, every month from April through August. During this period there was a cumulated deficiency of 4.53 inches of rainfall, and a cumulated excess of 6.3° F. mean temperature.

Within particular regions, favored by rainfall at critical periods for the spread of root rot, the picture was quite different. Thus after travelling southward from Greenville through 6 counties in which root rot was much below normal, it was found to be causing unusually extensive damage in the vicinity of Temple, Bell County. In many fields 60 to 85 percent of the plants had been killed, the average for this locality running nearly 70 percent although the county average was only 29 percent.

The mean figures for the 22 counties covered are given in Table 1, arranged here by the sections of the State as used in a previous study of losses from root rot (4) and also in Figure 1 of the present paper. Considerable variations from county to county are to be noticed, as well as variations between prevalence of root rot in particular counties this year and the 1928 county estimates (not previously published).

The mean ratios between prevalence in 1928 and in 1937, as found in Table 1, were used to estimate the loss for the entire State. The ratios determined for the three sections of the State in which fields were examined were used for these sections, and the mean ratio for the entire group was used for the remaining sections. Estimates of the percentage reduction in yield in the various sections for 1928 (4) were

Table 1. Summary of field estimates, September 20-24, 1937, of percentages of cotton plants killed by Phymatotrichum root rot. Estimates averaged by counties, and counties by sections as in map (Fig.1).

Sections of the State	Counties	No. of fields	Average estimated percentages of plants killed by root rot		Ratio 1937/1928
			1937	1928	
A. East Texas	Leon	21	0.1	1.5	0.07
	Anderson	20	0.0	1.0	....
	Cherokee	11	1.4	1.5	0.93
	Smith	35	0.5	0.1	5.00
	Wood	24	0.1	0.5	0.20
	Rains	27	0.04	1.5	0.03
	*mean, 6 counties	138	0.3	0.9	0.33
B. Eastern Marginal	Brazos	36	1.7	6.0	0.28
	Madison	19	3.4	2.5	1.36
	Milam	16	6.7	7.0	0.96
	*mean, 3 counties	71	3.1	6.0	0.52
D. Blackland Prairies	Hunt	41	2.7	12.0	0.23
	Collin	4	7.8	15.0	0.52
	Rockwall	32	14.8	15.0	0.99
	Dallas	57	8.1	35.0	0.23
	Ellis	49	15.6	9.0	1.73
	Hill	31	22.4	17.0	1.32
	McLennan	49	14.9	25.0	0.60
	Falls	32	4.2	12.0	0.35
	Bell	40	29.1	20.0	1.46
	Williamson	66	8.5	10.0	0.85
	Travis	92	8.3	9.0	0.92
	Caldwell	55	15.3	20.0	0.77
	Bastrop	13	21.5	15.0	1.43
	*mean, 13 counties	561	12.5	16.0	0.78
Entire group	*22 counties	770	9.4	13.0	0.72

*Mean for each section calculated for 1937 from sum of original estimates and for 1928 from sum of county estimates weighted for relative production in the different counties.

multiplied by the ratios to obtain the 1937 estimates given in Table 2. The final mean weighted estimate for the State, of 5.9 percent loss from the expected yield in the absence of root rot, suggests a crop loss of around 300,000 bales for Texas for 1937.

Table 2. Estimates by sections of cotton crop losses from Phymatotrichum root rot in Texas in 1937.*

Section of the State: Designation in map (Fig. 1)	Name of Section	Number of counties	Estimated reduction in yield, percent
A	East Texas	44	0.3
B	Eastern Marginal	8	3.4
C	Central coast	10	3.2
D	Blackland Prairies	33	10.0
E	Rio Grande Plain	28	12.1
F	Central	14	7.1
G	North Texas plains and prairies	23	5.6
H	Northern marginal	9	3.2
I	Edwards Plateau and Trans-Pecos	40	5.7
J	El Paso Valley	2	0.2
K	Northwest Texas plains	43	0.0
	Entire State **	254	5.9

* Estimated from percentage reductions in yield determined in 1928 study, multiplied by 1937/1928 ratios (Table 1), using sectional ratios as determined for A, B, and D, and the mean ratio for the entire group for the other sections.

** Mean for State calculated from sectional estimates weighted by approximate production in the various sections.

The estimates from Table 2 have been entered in the map (Fig. 1) which indicates the location of the areas for which the estimates were made. One change may be noted in the limits of these sections, from the areas shown in the 1928 study (4, Fig. 5). In the present map, Hall County has been transferred from section K, in which no root rot has been found, to the marginal section H. The disease was reported from this county by Peltier (6) and this report has been confirmed by specimens obtained from Memphis, Hall County, during 1937. In region I, root rot has not yet been reported from 10 counties in the central portion. These are included in this region as a matter of convenience without

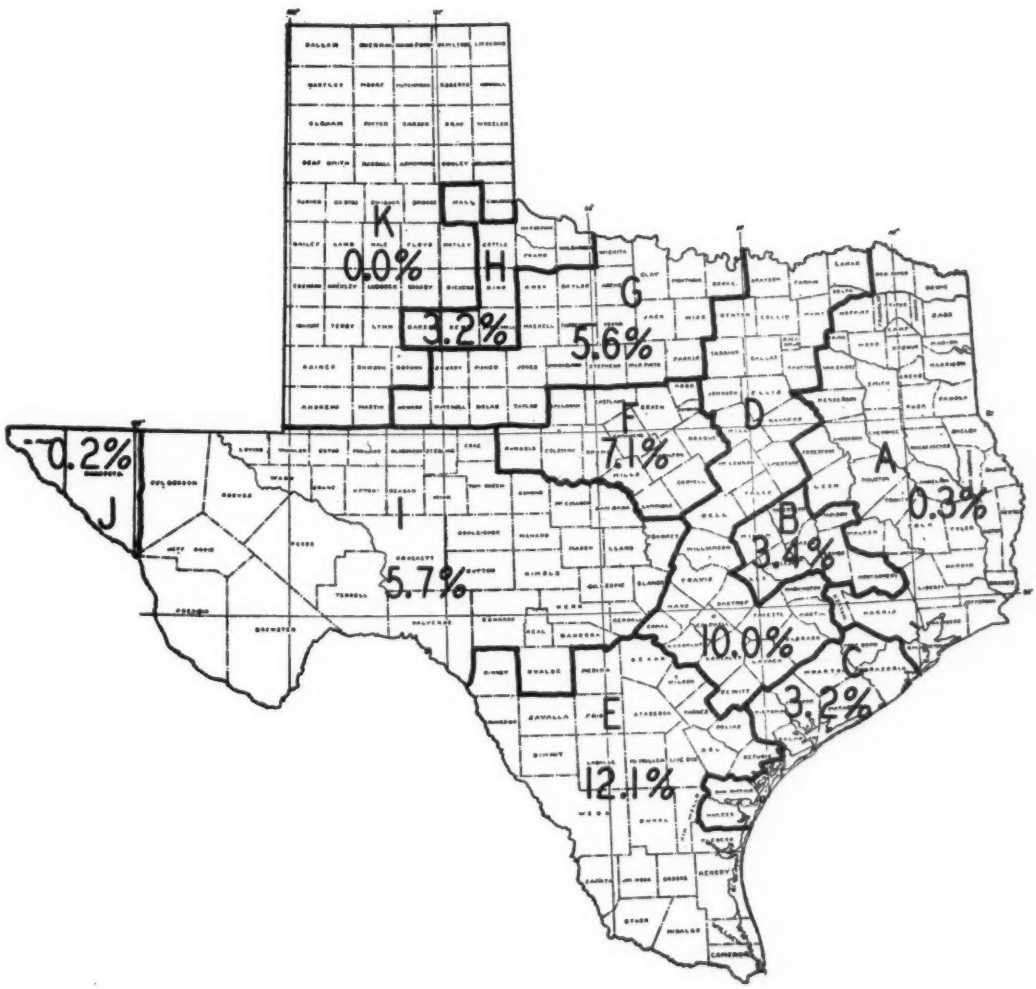

Figure 1. Estimated losses from cotton root rot in Texas in 1937. The figures give the estimated percentage reductions in yield for the various sections of the State, lettered as in Table 2.

affecting estimates of cotton crop losses, since little cotton is grown in these counties. The disease has not yet been found in Harris County, in section A. Root rot has now been reported from 200 of the 254 counties of Texas.

Conditions Affecting Local Prevalence of Root Rot

The large differences between prevalence of root rot in different counties suggests the question of the extent to which such differences are to be considered responses to current weather conditions. Previous study of this question (4, 7) has been made with data over a period of years but from a single locality. The present data made possible an evaluation of the factors apparently causing the large variations noted at this one time in prevalence of root rot from place to place.

The counties chosen for more intensive study were the ten in the Blackland Prairies region which are listed in Table 3. It is now well established that Phymatotrichum root rot is limited in general to nearly neutral or somewhat alkaline soil areas (9). These 10 counties are approximately uniform in including large areas of soils favorable for root rot; and estimates were obtained for at least 31 fields in each of these counties. Since these root-rot data were obtained by observations of fields along roads passing through the counties, rather than of fields grouped around any particular locality, weather data to be studied were averaged in a somewhat similar manner. For each county, the weather record within the county was given a weight of 2, a weight of 1 was assigned to data from the nearest adjoining weather station north along the route, and a weight of 1 to data from the nearest station south along the route, to obtain a "moving average" applicable to fields along the roads. The rainfall data used refer to the growing season of the 1937 crop, while the mean annual temperatures are averages of the "normal" temperatures as given by the weather bureau.

A preliminary calculation of the simple correlation between the percentage of root rot and the sum of rainfall from April through July gave the rather low value, $r = 0.56 \pm 0.14$.

The data were then analyzed in detail by the graphic multiple correlation method, which makes it possible to determine readily the final net regression lines expressing the individual effect of each of various independent variables on the dependent variable (1, p. 229). The data in Table 3 yielded the final net regression lines shown in Fig. 2. The first line shows the apparent effect on the percentage of plants killed by root rot of the mean annual temperature, after allowing for the effect of the differences in rainfall during each of the five months shown. The second line shows the apparent effect of the differences in April rainfall, after allowing for the effect of differences in May, June, July,

Table 3. Data used in graphic multiple correlation (Fig. 2) to find conditions affecting local prevalence of root rot in 10 counties in the Blackland Prairies section.

Counties (north to south)	Plants killed by root rot, percent	Mean annual temperature, °F.	Rainfall, 1937, in inches, for				
			April	May	June	July	August
Hunt	2.7	65.1	1.05	1.29	3.58	2.15	2.52
Dallas	8.1	65.2	0.81	0.90	4.16	1.97	2.54
Ellis	15.6	65.7	0.95	1.55	4.36	1.89	1.65
Hill	22.4	66.4	1.08	1.86	4.07	1.90	1.02
McLennan	14.9	67.1	1.14	1.63	3.63	1.95	0.67
Falls	4.2	67.1	1.21	1.43	3.52	1.99	0.61
Bell	29.1	66.8	0.73	1.55	2.98	3.25	1.02
Williamson	8.5	67.2	0.72	1.94	3.85	1.95	2.03
Travis	8.3	67.8	0.81	2.29	4.43	1.20	2.95
Caldwell	15.3	68.5	1.01	1.48	5.07	1.36	2.50
(mean)	12.9	66.7	0.95	1.59	3.97	1.96	1.75

and August rainfall and also in mean annual temperature. In the same way each of the other lines expresses the apparent effect on the percentage of root rot of the one variable shown in that graph.

It is evident that most of the variables considered had a definite effect on the development of root rot. The disease was slightly more abundant in counties with higher mean annual temperatures. Increases in April, May, June, and July rainfall had marked effects in increasing the percentage of root rot. This effect was greater as the season progressed. A difference of 1 inch of rainfall during April or May was associated with a difference of about 14 percent of root rot. One inch additional rainfall in June increased root rot apparently by about 20 percent; and the greatest effect was with a root-rot increase of about 32 percent with

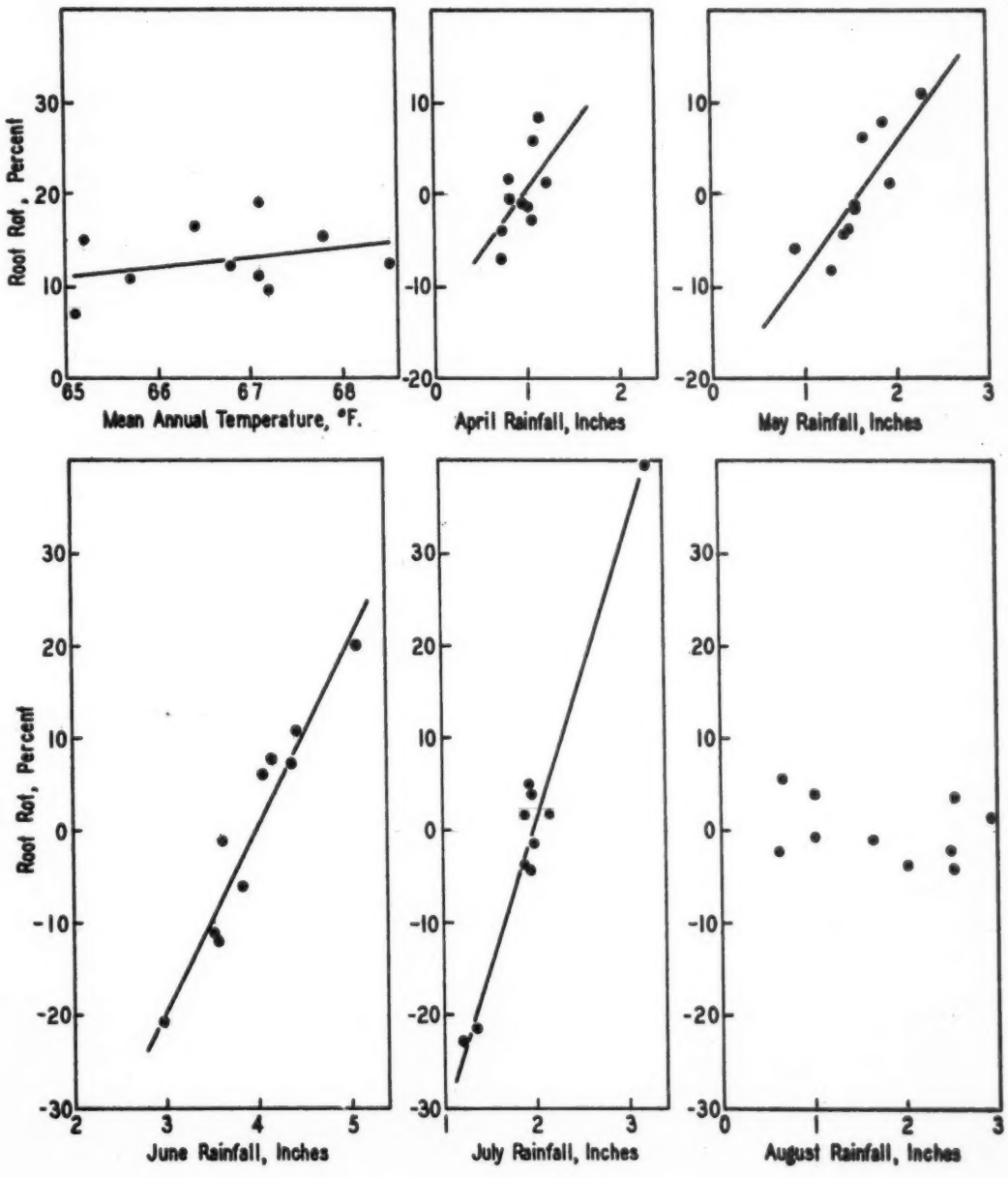

Figure 2. Net regression lines, showing the apparent effect on the percentage of plants killed by root rot in 1937, in 10 counties in the Blackland Prairies region, of the one variable shown in each graph, after allowing for the effect of all the other variables. The first graph shows the apparent net effect of normal mean temperature, after allowing for the differences in rainfall; the second, of differences in April rainfall after allowing for differences in rainfall in the other months and also for temperature differences; and so on.

one inch of July rainfall. However, it will be noted that the distinct differences in August rainfall were apparently without effect on the final percentage of root rot.

To check this graphic analysis, multiple regression and correlation coefficients were calculated mathematically (1, p. 170) using first all the variables considered in the graphs except the August rainfall which was clearly of no significance. The regression constants obtained were almost precisely the same as from the graphs. However, correction for the large number of variables and small number of cases lowered the correlation of .91, to $\bar{R}_{1.23456} = .79$.

Calculations in which the variables used were reduced to (1) the sum of April and May rainfall, (2) the June rainfall, and (3) the July rainfall, yielded a higher corrected value

$\bar{R}_{1.234} = .86$, and a standard error of estimate, $\bar{S}_{1.234} = 4.2\%$. The regression constants were again almost exactly as in the previous analyses, giving as the estimating equation:

> Per cent of plants with root rot = 15.5 (April plus May rainfall) + 20.5 (June rainfall) + 30.8 (July rainfall) - 168%.

This estimating equation applies only to the particular region for which it was worked out, and probably only for seasons in which the crop is equally advanced and the rainfall equally deficient. The extent to which the rainfall relation for the particular months as shown here will apply in other seasons cannot be determined without similar studies for other years. It may be possible to use such an equation more generally by applying the constants not to rainfall for particular months, but instead to rainfall for particular periods prior to the date of maturity of the bulk of the crop. It is to be noted also that the regression lines for 1937 (Fig. 2) are clearly linear and show no tendency to taper off with higher values. Evidently the rainfall did not become excessive during any of these months, in any of the counties, and probably remained usually well below the optimum for spread of root rot. With much greater rainfall the relation may become curvilinear and the constants determined in this study no longer apply.

Effect of temperature on prevalence of root rot. The effect of variations in temperature on growth of Phymatotrichum omnivorum in culture (2, Neal p. 890) and of low temperatures on viability of the fungus under controlled conditions (3, p. 959) have been studied before, as has also the effect of the changing temperature during the season on the progress of the disease (7). The relation of temperature to prevalence of the

disease in different regions, however, does not seem to have been considered beyond the conjecture that the temperature relation should be concerned in delimiting the range.

The data studied here showed a definite tendency for root rot to be more prevalent in the more southern counties, with higher normal mean annual temperatures. The slope of the regression line in the first graph would indicate that within the range studied an increase in mean temperature of about 1° F. is associated with an increase of about 1.1 percent of root rot. A slightly lower value was obtained in mathematical calculation of this regression constant.

A similar general relation is evident for the large sections shown in Figure 1. In general, the isotherms here tend to parallel the coast line. Beginning in the northwest portion K, in which root rot has not been found, the disease becomes progressively more prevalent through H, F, D, and E, in accord with the higher temperatures.

Root rot is prevalent in Texas throughout areas in which the mean annual temperature is above about 60° F., and is not prevalent in portions with a lower mean temperature. Normal mean temperatures for some weather stations near the edge of the known areas of infestation are recorded as: 60.0°, 61.6°, 60.9°, and 61.8° F.

The writer does not intend to suggest that prevalence of root rot is limited by mean air temperatures rather than for example by mean minimum or possibly occasional extremely low soil temperatures. Changes in mean air temperatures, as used in the present study, would presumably be associated with changes in these other temperature criteria.

Factors Affecting the General Prevalence of Root Rot in Texas

The more important factors influencing occurrence and destructiveness of Phymatotrichum root rot through Texas may be summarized as character of soil, temperature, and rainfall during the growing season. Of these factors, the first two would explain the general absence, presence in limited amount, or general prevalence of the disease in various regions. Thus, in East Texas (section A, Fig. 1) root rot is present only in limited areas, since many of the soils are somewhat acid and unsuitable for the disease. Sections B and C also include relatively large areas of more or less unfavorable soils. Farther west, the dark, non-acid upland soils predominate, and root rot is rather widespread on these soils. As has been pointed out above, the temperature relation then enters in, probably explaining the general differences in prevalence from absence of root rot in section K, through the increasingly warmer and more heavily infested areas H, G, F, D, and E. Finally, within any particular section with soil and temperature favorable for root rot, the destructiveness of the disease

from year to year is limited by weather conditions, chiefly the rainfall during the current growing season. For the cotton crop in seasons such as 1937, the rainfall from April through July would seem the important factor determining the yearly loss.

Summary

Estimates of losses to the 1937 cotton crop from Phymatotrichum omnivorum root rot were made on September 20-24 for 770 fields, in 22 counties. For the entire area, losses were below normal, agreeing with general low precipitation during the growing season. For the State, the loss in 1937 is suggested as about 5.9 percent of the expected yield in the absence of root rot, or over 300,000 bales.

Multiple correlation analysis of root-rot losses in 10 selected counties, in which the soils are approximately equally favorable for the disease, showed the important effect of April, May, June, and July rainfall. A multiple correlation coefficient, corrected for the small number of cases, of $\bar{R} = .86$ was obtained. An increase of 1 inch of rainfall in April or May was associated with increase of about 15 percent of root rot; 1 inch of rainfall in June with about 20 percent increase in root rot; and 1 additional inch in July with about 30 percent increase in root rot. The differences in August rainfall were apparently without effect on the percentage of root rot.

Increase in the mean normal temperature was associated with a slight increase of root rot. Root rot is not prevalent in sections of Texas with a mean normal temperature below about 60° F.

Presence or absence of root rot in different sections of Texas seems to be determined largely by the relative prevalence of favorable neutral to slightly alkaline soils, and high mean temperatures. Destructiveness of the disease within any particular period is then limited chiefly by the rainfall. For the cotton crop in 1937, rainfall from April through July was apparently the important factor.

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(Texas Agricultural Experiment Station).

OUTBREAK OF ASCOCHYTA BLIGHT ON COTTON IN SOUTH CAROLINA

George M. Armstrong

I have been very much interested in the outbreak of Ascochyta gossypii on cotton in the vicinity of Clemson. The specimens were brought in and calls received on July 27 when the disease was apparently being noted with some alarm by the farmers. This recalled to mind an outbreak in the first week of June 1929 in the counties of Oconee, Pickens, Anderson, and Greenville. This outbreak followed a solid week of general cloudiness and numerous rains. Warm, dry weather which followed checked the disease and nothing further was heard of it during that season.

I had my first opportunity to check some fields in Pickens County on Saturday, August 6, and found abundant evidences of the disease. Cotton has been making very rapid growth recently and several inches of new growth from the stalks were entirely free of disease though we have been having showers almost daily for the past three weeks. The lesions on the leaves are the largest I have ever seen. The diseased tissue has fallen from many leaves and they are sometimes cut into two or three pieces. There are also numerous dead leaves where infections have occurred at the base of the leaf petiole. I could not find diseased bolls although this would hardly be expected since most bolls are not sufficiently mature. I did find the fungus fruiting on the leaf bracts. Reports of the disease have come from only Oconee and Pickens Counties. I think it would be interesting to survey some of the fields later for boll-rot since it is reported in the Arkansas State Bulletion, No. 178 that boll rotting may follow such an outbreak.

(Clemson Agricultural College).

UNUSUAL PREVALENCE OF BACTERIAL LEAF SPOTS OF TOBACCO

MASSACHUSETTS: Angular leaf spot [Bacterium angulatum] is worse this year than for 7 or 8 years, causing severe damage to the leaves on the lower half of the plants in several known cases in each of the three Connecticut Valley Counties. This situation is not surprising considering the prevalence of the disease in the beds and the weather conditions since transplanting. However, in no instance has the typical "blackfire" condition been noted, which is common in other tobacco growing areas, following such unusually wet weather and the consequent water-soaking of the leaves.

Wildfire [Bacterium tabacum] is somewhat more noticeable than usual, though not so damaging as might be expected with the kind of weather that has prevailed during June and July. Moderate to heavy spotting of the lower leaves has been observed in only a few scattered fields, mostly in Hampden County. (O. C. Boyd, Massachusetts State College. August 4).

PENNSYLVANIA: Wildfire [Bacterium tabacum] on tobacco is again very serious in Lancaster County. One hundred percent of the fields are affected this year. Losses as yet are not great since harvest is just beginning. A severe rain storm could cause a very high amount of loss this year with the general infection now present. A survey in Clinton County, the other tobacco growing area in the State, showed wildfire in only one field. (O. D. Burke, Pennsylvania State College. August 10).

KENTUCKY: Two bacterial diseases, wildfire (Bacterium tabacum) and angular leaf spot or blackfire (B. angulatum), have caused extensive damage to dark fire cured and dark air cured tobacco, especially One Sucker, throughout the western part of Kentucky. Injury has been so extensive that many fields were not cut. Many others were cut before maturity. Late crops are affected but are not extensively damaged yet. Most of the crops in this area were at least two weeks earlier than normally. It is believed that the total damage to One Sucker and dark fire cured will be at least 50 percent. This figure may be higher because many crops that have been cut will be of poor quality because of excess spotting and immaturity. Burley tobacco in this area has been damaged some but no crops have been destroyed. A small amount of both bacterial spots was present throughout the growing season but the main epidemic and injury started about mid-July following very heavy rains early in July. The entire growing season has been so wet that farmers have had difficulty in cultivating.

There has been extensive injury from frenching (physiological) in many fields especially in low areas and in recently limed fields or those bordering limestone roads. The loss from drowning has been fairly extensive in many fields.

More potash starvation has been observed this year than in previous years both on tobacco and corn. (E. M. Johnson, Kentucky Agricultural Experiment Station, August 10).

FUSARIUM WILT ON TOBACCO IN PIEDMONT SOUTH CAROLINA

George M. Armstrong

The growth of burley tobacco is being tried by a number of farmers in four Piedmont counties of South Carolina this year for the first time. Through the courtesy of Mr. H. A. McGee, Tobacco Specialist, and Mr. C. D. Robertson, County Agent of Abbeville County, I have recently seen eight of these fields in the counties of Abbeville, Saluda, and Laurens. The growers all stated that no tobacco was ever grown before in so far as they are aware. I was surprised to find fusarium wilt (Fusarium oxysporum var. nicotianae) in six of the eight fields.

In Abbeville, the wilt was found as follows: 15 percent infection in a 2-acre field, 20 percent infection in a 3/4-acre field, no wilt in a 2-3/4-acre field.

In Laurens, 10 percent infection in a 1-acre field, 2 percent infection in a 1-1/2-acre field. In another 2-acre field located on three terraces, there was 35 percent infection covering about 1/5 of 1 acre in

the lower terrace. There was much less of the wilt on the upper terraces and the average was 10 percent for the entire field.

All of these fields had been grown in cotton previously and cotton wilt was known to be present. At least two of the growers were quite sure that the cotton wilt was attacking the tobacco. There were several sources of seed and each grower had his own tobacco plant bed.

(Clemson Agricultural College).

VARIOUS REPORTS ON DISEASES OF SPECIAL CROPS

DOWNY MILDEW OF TOBACCO IN MASSACHUSETTS: There has been no indication this year that downy mildew [Peronospora tabacina] appeared in the fields as the result of spread from beds or from plants that were diseased when set in the field. However, in several instances in all three of the Connecticut Valley Counties, the disease developed on the lower leaves of plants that were infected prior to transplanting and before the fungus was rendered inactive by the high temperatures of the latter part of June. (O. C. Boyd, August 4).

DISEASES OF MINT IN INDIANA: On July 29, many large fields of peppermint in northern Indiana were severely infected with anthracnose, Sphaceloma menthae Jenkins. Anthracnose occurred in fields planted last spring, as well as on older stands of peppermint. The disease caused only slight loss on the first cutting of peppermint, which was being distilled at that time. However, severe infection and loss will likely result on the second growth in severely infected fields. Fields of Scotch and common spearmint examined showed very little infection. Rust, Puccinia menthae, on spearmint was conspicuous by its absence. In 1937, rust was very prevalent on spearmint. (R. C. Baines, Agricultural Experiment Station, Purdue University).

PSYLLID YELLOWS IN CENTRAL AND EASTERN NEBRASKA

R. W. Goss

The chief item of pathological interest in this state, since the wheat crop was harvested, is the very severe development of psyllid yellows. Psyllids are abundant on potatoes and tomatoes in central and eastern Nebraska for the first time. The damage on potatoes is very severe in small garden patches where the loss is at least 50 percent. In commercial fields of southcentral Nebraska the infestation is more spotted and chiefly on the margins of fields. In western Nebraska severe infestation occurred in the early planted fields and loss is severe enough so

that some fields may not be harvested. Psyllids are also present in the late planted dry land fields of northwestern Nebraska, where they have not commonly occurred in previous years. The amount of damage they will do in these fields is problematic, as there is no spray equipment available in any of this newly infested area.

This is the typical psyllid yellows of potatoes and tomatoes and this particular infestation is interesting because of the invasion of additional territory. While no accurate surveys have previously been made in central and eastern Nebraska, we have never had any cause to suspect its presence. This year, however, the condition has been common on both potatoes and tomatoes. We have made careful surveys in the past throughout the western counties where certified potatoes are produced, and psyllid yellows - up to this year - has always been pretty much confined to Kimball, Banner, Scotts Bluff, and Morrill Counties. This year the infested area has extended north into Box Butte County and the infestation is severe enough so that we have had to purchase a sprayer for the experimental farm in that county. The spread of the trouble three or four hundred miles eastward this year raises the question whether we are going to continue to have this in the future and whether there is any danger of its spreading into States east and north of us.

(Nebraska Agricultural Experiment Station).

REPORTS ON LATE BLIGHT OF POTATO

MASSACHUSETTS: Only scattered infections of late blight [*Phytophthora infestans*] were observed in the three Valley Counties where the temperatures have been comparatively high during the rainy periods of June and July. In Bristol and Plymouth Counties, however, the disease has developed steadily in unprotected or poorly sprayed fields, particularly in the shoreline towns. (O. C. Boyd, August 4. Massachusetts State College).

NEW YORK: (July 31). I think probably our main worry right now is that of too much rain and the possibility of late blight. I have seen it in gardens where it is already severe, but so far I have not encountered it in the larger commercial fields which have received the regular applications of copper. I would not be at all surprised, however, to see more of it within the next few days unless we have a very decided change in the weather. In four summers of work in Western New York I think this is the first time I have seen any blight in July, - our infection last year coming late in August.

(August 6). In Wyoming County many garden potatoes (mostly untreated) have already been killed by blight. Practically all commercial

fields contain scattered hills of blighted vines and quite a few fields contain spots of about a square rod each where damage has been severe. Most of the spread took place last week and hot dry weather this week helped check the spread, - although plants already infected continue to go down. Growers are dusting or spraying. One grower applied 115 pounds of copper-lime dust per acre inside of ten days. Some of these blight notes refer to the upper part of Allegany County. (T. C. Rawlins, Weekly News Letter, August 8).

Blight was observed occasionally in Allegany County August 2 and was absent in Steuben County. (R. W. Leiby, Weekly News Letter, August 8).

PENNSYLVANIA: (August 9). Late blight is present in every county in Pennsylvania and severe losses have been experienced throughout the southeastern area of the State. Rots are already developing in that area. The recent hot weather has only tended to slow up the disease rather than to kill it out and there are evidences that the disease will continue to be rather severe throughout the remainder of the potato growing season. The disease was discovered in Pennsylvania on June 20, which is believed to be the earliest recorded date for this State. (C. D. Burke, Pennsylvania State College).

VIRGINIA: (August 3). Late blight, which was first noticed on June 6, spread rapidly during the month of June and resulted in heavy losses to the potato growers throughout Eastern Virginia. Usually the weather is unfavorable for late blight in June but this year it was especially favorable for the disease during the entire month. Precipitation at Norfolk was 3.03 inches (nearly double normal) and occurred on 16 days. The mean temperature for the month was only .1° F. below normal, but on eleven days it ranged from 1 to 11° below normal. (Harold T. Cook, Virginia Truck Experiment Station).

POTATO DISEASES IN NEBRASKA CERTIFIED FIELDS LAST YEAR

R. W. Goss

We have just tabulated results on potatoes grown for certification last year. This, of course, is not representative of the whole commercial acreage as the seed planted is better than average and the fields are rogued during the season as well as some being rejected for too much disease. Last year the second inspection of 6,300 acres showed only traces of the mosaics, 0.1 percent spindle tuber, 0.9 percent fusarium wilt [*Fusarium* spp.], and 0.07 percent blackleg [*Bacillus phytophthorus*].

The bin inspection on 481,000 bushels showed 2.2 percent common scab [Actinomyces scabies], 2.8 percent pit scab, 3.3 percent stem end rot or vascular discoloration, and 0.18 percent spindle tuber.

These data show clearly the severity of scab and fusarium wilt in our area, whereas virus diseases are of minor importance with the possible exception of spindle tuber.

(Nebraska Agricultural Experiment Station).

DISEASES OF CANNING TOMATOES IN INDIANA AND THE RELATION TO SOURCE OF TRANSPLANTS

H. Rex Thomas[1/] and R. W. Samson[2/]

A total of 108 fields, representing all of the important tomato-growing sections of Indiana, have been examined in an attempt to determine the relation of the diseases present to source of the transplant used. Most of the transplants for these fields came from open-field plantings in Georgia, Tennessee, southern Illinois, and southern Indiana. Some fields were set with greenhouse and cold-frame grown plants. The observations are summarized in the accompanying table.

Table 1. Tomato diseases observed producing appreciable losses in Indiana fields set with transplants from various sources.

Source of plants	Number of fields examined	Number of fields seriously infected with: Bacterial wilt	Bacterial spot	Collar rot	Miscellaneous diseases
Georgia	55	8	33	2	
Illinois	10	0	7	7	
Tennessee	12	0	9	0	
Mississippi	1	0	0	1	
Arkansas	6	0	6	0	
Open seeded in Indiana	12	0	3	1	1. Bacterial canker 2. Macrosporium stem lesions
Greenhouse and cold frame	9	0	2	0	
Seeding in place	3	0	0	0	Macrosporium leaf spot and stem lesions
Total	108	8	60	11	

1/ Agent, Bureau of Plant Industry.

2/ Horticulturist, Indiana Agricultural Experiment Station.

Bacterial spot (Bacterium vesicatorium Doidge) was found to be rather generally spread throughout the tomato-growing sections of the State. The disease has been responsible for much early defoliation, blossom drop, and fruit spotting. Heavy rain storms followed by frequent showers and nights with heavy dews have made conditions favorable for the development of this disease. More bacterial wilt (Bacterium solanacearum E.F.S.) has appeared than usual this year in fields set late with Georgia plants. Losses ranging from 8 to 40 percent have been noted. Collar rot (Macrosporium solani Ell. & Mart.) [Alternaria solani] has been no more serious than in the past on out-of-state plants. As in previous years, late shipments from Georgia and Illinois were commonly infected with macrosporium leaf spot and stem lesions, causing many lots of plants to be rejected. Several shipments of plants from Mississippi were very severely infested with collar rot this year and most fields set with such plants had to be reset. Collar rot was found in open-seeded plant beds at Vincennes, Indianapolis, and Red Key, Indiana, late in the plant bed season.

Frequent observations of a considerable amount of bacterial spot on plants from a certain source or shipment in one part of a field and absence of the disease on plants from another source or shipment in the same field indicate that, in general the disease must have come in on the plants. The evidence accumulated through observation of the 108 fields does not, however, warrant very positive conclusions. The disease was found on transplanted plants from all plant-growing regions with the exception of some grown in greenhouses and cold frames at Waterloo and Pierceton, Indiana.

No special effort was made to trace the seed sources or seed treatment but it is known that bacterial spot has appeared on plants from seed treated with 1-3000 mercuric chloride for 5 minutes and also with seed treated with New Improved Ceresan 1-1200 for 5 minutes. Some plants were from seed receiving both treatments. The majority of the observations made point to the plant beds as the source of bacterial spot infection but several incidences made it unwise to exclude possibilities of some local infection. Most of the tomato acreage in the State is set on land that has not grown tomatoes for at least two years.

(Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry and Purdue Agricultural Experiment Station).

REPORTS ON BEAN DISEASES

RUST ON LONG ISLAND: Rust infection has caused severe leaf damage in some bean fields in Nassau County. (Orson S. Cannon, Weekly News Letter, August 8).

RUST IN EASTERN VIRGINIA: For the first time within the writer's observation bean rust (Uromyces phaseoli typica) has been found on the spring and summer crop of beans. This disease was found causing slight damage in the vicinity of the Experiment Station about the first of July and was causing severe damage in a commercial six-acre field of beans on July 12. Since then it has gradually disappeared. Its presence in June and July this year was probably due to the abnormally wet and cool weather. (Harold T. Cook, Virginia Truck Experiment Station, August 3).

ANTHRACNOSE SEVERE IN MASSACHUSETTS: Bean anthracnose [Colletotrichum lindemuthianum] has continued to cause severe losses in both home gardens and commercial plantings. (O. C. Boyd, August 4, Massachusetts State College).

DISEASES OF CUCURBITS

ANTHRACNOSE ON CUCUMBERS IN MASSACHUSETTS: Cucumber anthracnose [Colletotrichum lagenarium] appeared unusually early and caused marked foliage injury during the latter half of July in Bristol County and other eastern sections of the State. (O. C. Boyd, August 4, Massachusetts State College).

DISEASES OF CUCURBITS IN NEW YORK: (Reports from Weekly News Letter). Long Island: Bacterial wilt [Bacillus tracheiphilus] is common in fields of cucumbers. (H. C. Huckett and H. S. Cunningham, August 1).

Monroe County: (August 1).--There is considerable bacterial wilt on squash. Melons are showing considerable bacterial wilt in most fields and some mycosphaerella blight [M. citrullina]. Fusarium wilt is taking them rapidly on infested soil. Some alternaria leaf spot [A. cucumerina] has appeared and seems to be spreading. Bacterial wilt on cucumbers is fairly general but not yet severe. (August 8)--A few fields of melons and cucumbers have considerable mosaic. (R. G. Palmer).

Ulster County: In one large field of melons there is perhaps 3 or 4 percent of bacterial wilt. (C. G. Small).

Orleans County: Wilt is rather rare now on cucumbers. (A. G. West, August 1).

DISEASES OF CUCURBITS IN SOUTH CAROLINA: The following report on cucurbit diseases was taken from a statement by Dr. C. J. Nusbaum of the Edisto Experiment Station, Blackville, South Carolina:

"Downy mildew [Pseudoperonospora cubensis] appeared earlier in 1938 than in 1937, and was severe upon cantaloupes and honey dew melons.

Cucumbers, being earlier, were less seriously affected, and the damage, which occurred during the latter part of the harvest season, was minimized by weak market conditions.

"Powdery mildew [Erysiphe polygoni] was unusually abundant and occasioned serious losses in certain fields of cantaloupes where the disease had an early start.

"Anthracnose [Colletotrichum lagenarium] was present upon all cucurbit crops and was especially severe upon watermelons and honey dew melons." (G. M. Armstrong, August 10, Clemson Agricultural College).

CELERY DISEASES REPORTED FROM VARIOUS STATES

MASSACHUSETTS: Both early blight [Cercospora apii] and late blight [Septoria spp.] of celery are unusually severe for this time of year, particularly in unprotected plantings. (O. C. Boyd, August 4).

NEW YORK: Nassau County (O. S. Cannon). Early blight of knob celery is increasing in severity where control measures have not been applied.

EASTERN VIRGINIA: Early blight (Cercospora apii) caused only slight losses to celery until late in June, but during the first half of June late blight (Septoria apii) did considerable damage in some plantings. Late blight is seldom found on the spring celery in this area, but early blight frequently causes severe damage. (Harold T. Cook, August 3, Virginia Truck Experiment Station, Norfolk).

OTHER REPORTS ON VEGETABLE DISEASES

POTATO DISEASES IN MASSACHUSETTS: (For late blight see page 328). Early blight [Alternaria solani] is about normal this year but both Rhizoctonia and black-leg [Bacillus phytophthorus] have caused unusual damage in all sections. (O. C. Boyd, August 4).

TOMATO LEAF MOLD DESTRUCTIVE IN A GARDEN IN SOUTH CAROLINA: Tomato leaf-mold [Cladosporium fulvum] destroyed the plants in one garden on the campus by July 30. These plants were infected when removed from the greenhouse. This is the second season in the past five years that I have noted that plants were killed in the field by leaf-mold. (G. M. Armstrong, August 10).

LATE BLIGHT ON TOMATO IN NEW YORK: Fruit rots and phytophthora blight [P. infestans] are causing losses in tomatoes in Nassau County, Long Island. (O. S. Cannon, Weekly News Letter, August 1).

ONION DISEASES IN MASSACHUSETTS: Both downy mildew [Peronospora destructor] and "blast" developed rapidly in the seed onions and the seed-sets in the Connecticut Valley fields following the prolonged rain of July 18 to 23. The acreage of seed onions is very small this year compared with the set onion crop. No doubt the extremely heavy losses in the seed crop last year from "blast" and mildew accounted for the further reduction in acreage this year. It is estimated that the reduction in yield in the seed crop will be around 40 to 50 percent this year from "blast", thrips, and mildew. The yield and quality of the set onions were unusually good this year, but considerable trouble in storage may be expected as a result of the wet weather after pulling and before topping. (O. C. Boyd, August 4).

CERCOSPORA BLIGHT ON CARROTS IN MASSACHUSETTS: Cercospora leaf blight [C. apii carotae] is unusually severe for this time of year. (O. C. Boyd, August 4, Massachusetts State College).

EGGPLANT WILT ON LONG ISLAND: (August 1)--In Nassau County all plantings of eggplant observed are infected with Verticillium albo-atrum and from 25 to 75 percent of the plants are wilting and dying as a result. (August 8)--Eggplants are recovering from wilt to quite an extent, so damage due to this disease will not be so great as was at first expected. (O. S. Cannon).

X-DISEASE OF PEACH FOUND IN MASSACHUSETTS

O. C. Boyd

On August 2, E. M. Stoddard of the Connecticut Experiment Station identified the X-disease in two peach orchards in Worcester County and one in Middlesex County. He was conducted to the orchards by Extension Pomologist, W. H. Thies; also other members of the Massachusetts and Connecticut experiment station staffs were included in the diagnosis party.

In each instance, diseased chokecherry trees showing what Mr. Stoddard considered typical symptoms of the X-disease were more or less abundant nearby. The grower in Marlboro (Middlesex County) stated the trouble had been present in his orchard for about ten years and that it had spread slowly during that time in spite of the removal of prominently diseased trees. Professor Thies estimated that around 25 percent of the trees in that orchard showed symptoms, and about 75 percent and 90 percent for the two Worcester County orchards.

(Massachusetts State College, August 4).

LEAF SCORCH ON APPLE FOLIAGE IN NEW YORK

M. B. Hoffman

Leaf scorch is being reported from many sections of the State this year. The trouble seems to be more common in young plantings, some of which have not received spray. Since studies on the nutrition of the apple carried out in sand or water cultures has shown that the absence of potassium from the medium caused leaf scorch it is only natural to think of a possible deficiency of this element when trees develop leaf scorch under orchard conditions. However, in the Pomology orchard at Ithaca some young trees that have received liberal applications of potassium nitrate for the past several years are showing definite leaf scorch this summer. It is impossible to distinguish this marginal burning from that which is occurring on leaves of trees growing in the absence of potassium in greenhouse cultures. In recent experiments reported from New Hampshire, applications of potash caused an increase in the amount of this element found in the petioles of the leaves but failed to correct a condition of leaf scorch.

Apparently there are other factors that will cause leaf scorch besides a potassium deficiency. Spray injury in its many forms, root injury from poor soil aeration or low temperature and slow root growth of young trees caused by late planting in dry seasons are a few conditions that are likely to be associated with leaf scorch and makes exact diagnosis of such troubles a very difficult matter. Any condition that interferes with normal root growth may cause a mineral deficiency with characteristic foliage symptoms. Considered from this viewpoint, the leaf scorch in some orchards may be actually due to a deficiency of some mineral element in the leaves. However, this does not mean that there is not an adequate supply of the particular element in the soil for normal plant growth or that applications of fertilizer containing the element in question would correct the trouble. The fundamental difficulty is that the roots are unable to take up and supply a sufficient quantity of mineral elements to the top for normal leaf growth.

(Weekly News Letter, August 1).

FRUIT DISEASES REPORTED FROM INDIANA

R. C. Baines

Considerable apple scab [*Venturia inaequalis*] infection on leaves and fruit was observed in many orchards visited during July. In a few orchards, abundant secondary scab infection occurred on the terminal leaves of very susceptible varieties. Meteorological conditions this year have been exceptionally favorable for the development and spread of apple scab.

During May, strawberry plants, Premier variety, infected with red-stele-root rot were found in two distantly separated fields in southern Indiana. A phycomycetous fungus, apparently a Phytophthora, was isolated from diseased roots. A root rot of strawberries, of the black root rot type, caused a serious loss in one field. Cultures of Fusaria were isolated from the diseased roots.

(Agricultural Experiment Station, Purdue University).

FURTHER ESTIMATES ON PROBABLE STEM RUST DAMAGE THIS YEAR

More recent information concerning probable stem rust damage in the spring wheat area is reported by E. C. Stakman to the Bureau of Entomology and Plant Quarantine, July 27-29. According to Dr. Stakman there was likely to be very little change in the situation in this region except on durum wheats.

In the northeastern corner of South Dakota there is so little susceptible wheat that damage will be negligible, therefore, since, as noted in the preceding issue of the Reporter (page 285), other parts of the State escaped with little damage also, the total loss for South Dakota will not be very high. The loss for Minnesota will also be relatively low, since most of the spring wheat is Thatcher and stem rust on other small grains did not reach damaging proportions.

In North Dakota, however, rust attack is very severe on susceptible varieties of bread wheats. The total damage indicated by conditions at the time the report was made, to Ceres and Marquis in the western part of the State (west of a line running north and south through Rugby) is roughly estimated at 35 to 50 percent, probably about 40 percent and possibly more. Eastward the loss may average 25 percent or more. Especially heavy damage is probable in the upper Red River Valley. On Ceres in Cass and Traill Counties it is probably 45 percent, and in southern Grandforks County 40 percent.

On durum wheats rust infection is in general light to moderate. Occasional fields of Kubanka are heavily rusted, because some of the strains of this variety are very susceptible to race 56. However, it seems likely that durums as a whole will not be severely injured.

Estimates of damage in eastern Montana are not possible as yet, but losses there are likely to be heavy, especially in the northeast.

In eastern Colorado there will be very little damage except to late fields of wheat and barley.

In the winter wheat region east of the Mississippi River the total loss from stem rust will not be really significant, although there will be some damage to late barley and some to late oats.

"In general", according to Dr. Stakman "stem rust in 1938 will not be nearly so destructive as in 1935 and 1937. One of the most significant features of rust development, however, is the fact that the heavy infection extends unusually far west."

WHEAT DISEASES REPORTED FROM SOUTH CAROLINA

George M. Armstrong

The infection of mildew (Erysiphe graminis) on wheat was the heaviest this year that I have ever observed. Mr. Nettles, of the Extension Service, brought in plants on several occasions and believed that considerable damage was being done.

Leaf rust [Puccinia rubigo-vera tritici] on wheat was widespread.

Fifteen percent of plants in one six-acre field of wheat in Oconee County were found to be infected with the wheat nematode [Anguina tritici].

(Clemson Agricultural College).

BRIEF NOTES ON PLANT DISEASES

DISEASES OF SWEET CORN IN NEW YORK: (Reports from Weekly News Letter). Rust [Puccinia sorghi] and smut [Ustilago zeae] are present in Nassau County but are not causing much loss in most corn fields. (O. S. Cannon, August 8).

Although Stewart's disease [Aplanobacter stewarti] on sweet corn in Rockland County started with a vengeance, for some reason or other it has not continued. (W. J. Clark, August 1).

CORN RUST IN GEORGIA: Corn rust (Puccinia sorghi) has been observed in a number of fields in Brooks and Tift Counties. In some cases practically every leaf on the stalk has been covered with rust lesions. However, since the disease appeared so late in the season it is doubtful whether much loss in yield has resulted. (S. B. Fenne, Extension Plant Pathologist).

LEAF SPOT OF ALFALFA IN MASSACHUSETTS: Pseudopeziza leaf spot [P. medicaginis] has caused nearly complete defoliation of a one-year-old

planting in a waterfront field of Bristol County, according to County Agent Chas. Harris (July 19). (O. C. Boyd, August 4).

A LEAF SPOT OF MARIGOLD IN MASSACHUSETTS: A serious leaf-spotting disease is causing heavy damage to a bed of marigolds in Amherst. It is characterized by many very small, circular yellowish to red spots which cause stunting and distortion of the leaves. Microscopic examinations revealed organisms. (O. C. Boyd, Massachusetts State College, August 4).

JULY WEATHER

(From Weekly Weather and Crop Bulletin, August 2).

The weather of July was characterized by moderate warmth and unevenly distributed moisture, though rainfall was approximately normal or above in most sections of the country. July rainfall is normally of the showery type and therefore spotted, but this year large areas had uniformly above normal.

Figure 1 shows that the temperature averaged near normal generally over the eastern third of the country and throughout the South, although in the eastern Lake Region it was 2° or 3° above normal. In the central and northern trans-Mississippi States most stations reported monthly means from 2° to 5° above normal, while the far Northwest had a decidedly warm month, the average temperature ranging up to 6° or 7° in excess of normal. The Rocky Mountains and Great Basin had about normal warmth.

Figure 2 shows that July rainfall was above normal east of the Mississippi River, except in local areas, principally the Lake region and upper Ohio Valley where less than normal occurred. Between the Mississippi River and Rocky Mountains considerable areas had less than normal rainfall, most pronouncedly the southern Great Plains and southern Texas. The subnormal areas included Minnesota, eastern South Dakota, southern Iowa, and northern Missouri, eastern Colorado, Kansas, Oklahoma, and northwest Texas. The Great Basin of the West had abnormally heavy rain, while the falls in the western portions of the Dakotas and in Montana were in excess of normal.

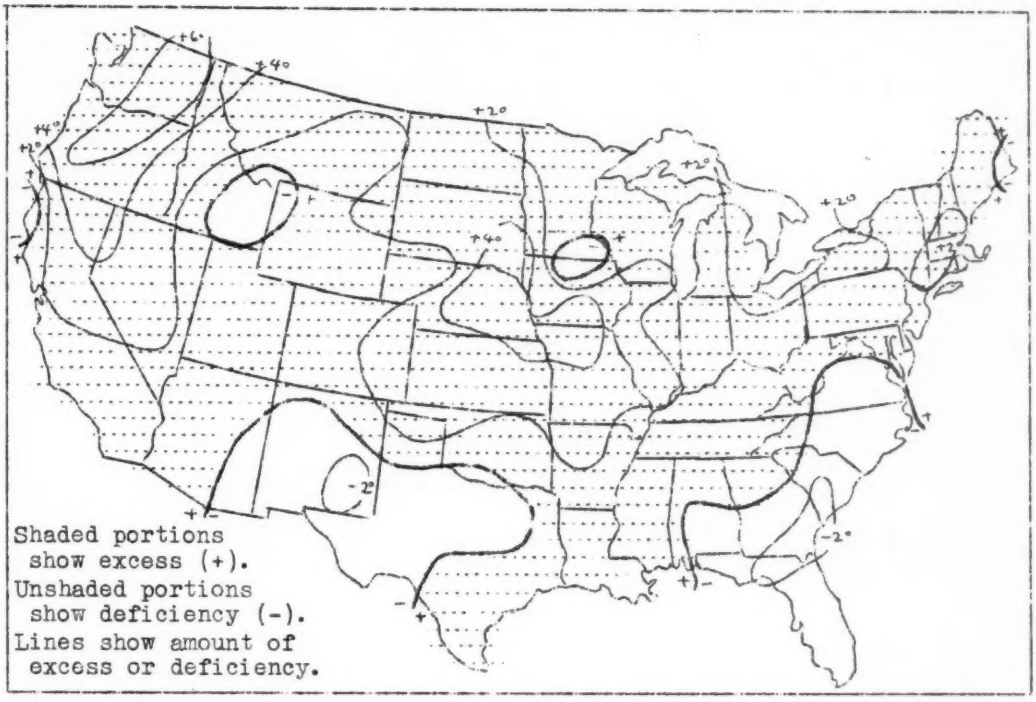

Fig. 1. Departure of Mean Temperature from the Normal for July 1938.

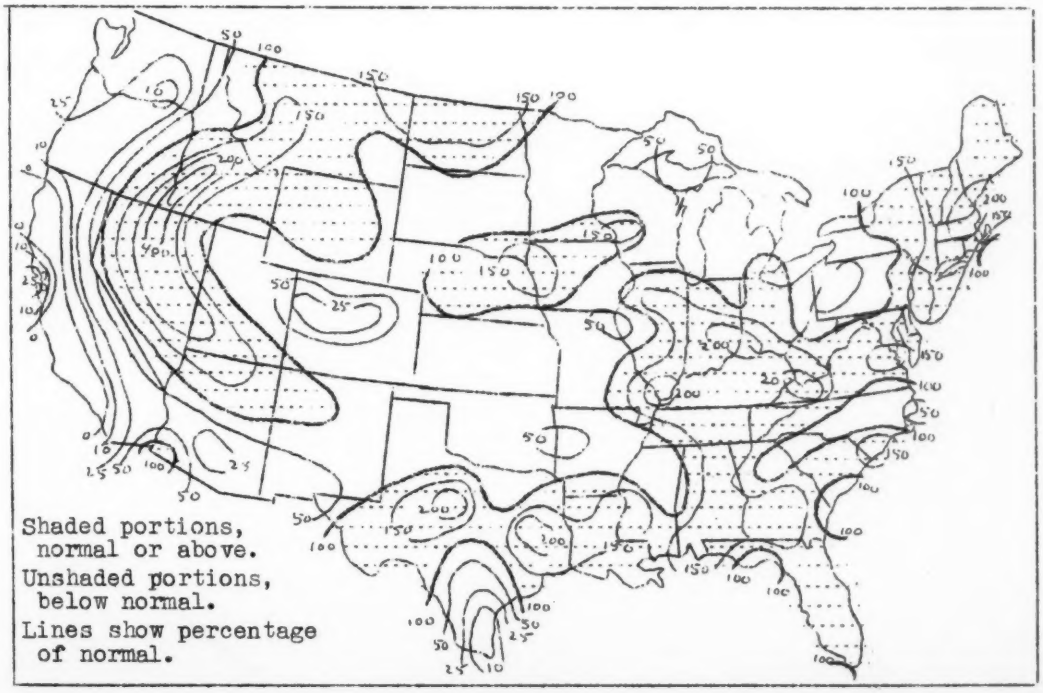

Fig. 2. Percentage of Normal Precipitation for July 1938.